Dimensions of mother-infant interaction and the development of social and cognitive competence in preterm infants

Wijnroks, Alexander

SUMMARY

This thesis reports on a longitudinal study investigating the contribution of characteristics of the preterm infant and its social environment to individual differences in social and cognitive competence. This study was aimed at clarifying some of the mechanisms or potential pathways by means of which infant characteristics and early mother-infant interaction interact and predict infant competencies. A second objective of the study was to investigate the effects of a short-term intervention program. The purpose of the program was to facilitate cognitive competence in preterm infants by improving the infant's responsiveness and its ability to regulate attention and emotion through the enhancement of the mother's sensitive responsiveness and the quality of her stimulation. The results of this study are thought to increase our understanding of what constitutes a beneficial environment for the development of preterm infants. Such knowledge is intended to provide clues for the development of effective intervention strategies in future.

Chapter 1 is a general introduction to the subject of this thesis. It is claimed that the preterm or low-birth-weight infant is known to be at risk to develop learning disabilities, visual motor deficits, language delays, attention-deficit disorders and behaviour abnormalities, but that it has been difficult to predict at an early stage of development which infants will later have such problems. Further, longitudinal studies have shown that to predict the probabilities of developmental outcomes in children born prematurely with any degree of certainty, both the infant's characteristics and the quality of the caregiving environment have to be considered. However, exactly what constitutes a beneficial social environment for infants born prematurely is not known. In particular, research is needed to identify the aspects of maternal interactions which are effective with preterm infants.

In this study attention will be paid to the influence of problems in postural control on mother-infant interaction and cognitive competence. Although, relationships between a preterm birth and postural problems have frequently been demonstrated, there is hardly any knowledge about the short- and longterm consequences of these problems. Finally, little is known of the development of preterm infants in terms of changes and stability. To increase our knowledge on these themes, this study investigates age-changes and inter-age stability of the infant's interactive behaviour, its ability to learn contingencies, its ability to solve problems, its general cognitive status and quality of attachment.

Chapter 2 is a theoretical chapter and it is divided into two parts. In the first part, from different theoretical viewpoints, ways in which maternal activities may influence several aspects of the child's competence in the areas of social-emotional, cognitive, motivational and attentional development are suggested. The second part describes the characteristics and development of preterm infants. We trace in how far the dimensions of maternal behaviour identified in part 1 are of special relevance for the development of preterm infants. After a discussion of some problems in the interpretation of differences in early mother-infant interactions between preterm infants and their full-term counterparts, a rationale for intervention is formulated. The intervention program, which is based on current theories about attention, emotion regulation and stimulation, intends to encourage the mother to provide stimulation that is not too intensive and that is given at the right moment without interupting the infant's attention and activities.

In Chapter 3 the design (short-term longitudinal) and method of the study are described. Testing occurred in 5 waves and covered the period 6 months to two years of age. In order to evaluate the effects of the intervention program, a non-equivalent, untreated control group design with a pretest and a posttest was used. The sample under study consists 66 mothers and their preterm infants. Infants were born after pregnancies of less than 37 weeks in the Groningen University Hospital. The mothers of 25 infants received intervention (the intervention group). The remaining 41 infants formed the total control group. The 25 dyads of the intervention group were matched with 25 infants (i.e. the matched control group) of the total control group. Intervention was given at 6, 9 and 12 months. Investigation occurred on the following area's: mother-infant interaction; quality of attachment and cognitive competence. De following aspects of cognitive competence were distinguished: general cognitive status, contingency learning, and problem solving. Observations of mother-infant interacties were undertaken in the home at 6, 9, and 12 months using videorecordings. Quality of attachment was assessed at 12 and 18 months in the laboratory using the Strange Situation. The Bayley Scales of Infant Development were used at 6, 12 and 24 months to assess the infant's general cognitive status. A contingency learning task was developed to investigate the infant's ability to learn contingencies. It was used at 6 and 12 months. Finally, two problems solving tasks were developed to examine the infant's problem solving ability at 18 and 24 months.

In Chapter 4 the development and determinants of interactions and attachment between mothers and their preterm infants are investigated. Next, the results of the effect of the intervention program on mother-infant interaction

are presented. Finally, the relationship between mother-infant interaction and quality of attachment are discussed.

The results of the observations of mother-infant interactions revealed that, of all the infant interactive behaviours studied, only 'duration' and 'intensity of positive emotional behaviour' changed over the 6 month period, in particular between 9 and 12 months. As infants became more clear in their emotional displays, mothers increased in 'sensitive responsiveness'. Mothers of preterm infants showed a moderate to high degree of stability in their interactive behaviour during the second half of the first year of life of their children, while the correlations for the infants indicated mainly instability. The relationships between maternal and infant interactive behaviours were not initially very strong, but became stronger with increasing age. Zero-order correlations revealed that 'sensitive responsiveness' and 'involvement' of the mother were positively related to 'positive infant emotional behaviour' and 'responsiveness' of the infant. Further, our findings confirmed in part those found by researchers that a high intensity of maternal stimulation is related to more negative responses in infants. Such a pattern, however, was found only after 6 months.

In contrast to our expectations, the relationship between neonatal characteristics and mother-infant interaction increased over time. Further, it appeared that mothers of infants scoring high on a neonatal risk index were more likely to be more active than mothers of infants scoring low on the risk index. In addition, significant relationships were found between the level of the mother's anxiety during the period of infant's hospitalization and her interactive behaviour. Mothers who reported to be very anxious were more active, scored at a higher rate on level of involvement and stimulated their infants more intensively than mothers who reported to be less anxious. Early problems in postural control appeard to be related to the infant's rather than to the mother's interactive behaviour.

Slight effects of the intervention program on mother-infant interaction could be detected. Mothers who received intervention scored higher on 'sensitive responsiveness' and stimulated their infants less intensively than mothers who received no intervention. Infants of intervention mothers appeared to be more 'responsive' than infants of control mothers.

As predicted, the preterm infants in our study were not insecurely attached more often than infants in normal, low-risk populations. On the contrary, we found somewhat more securely attached infants and fewer insecurely-resistant infants than expected on the basis of normative data. Our data and those of many others clearly indicate that the mother-infant relationship is strongly biologically buffered from perturbations in early development. Our data showed that maternal and infant behaviour could predict the quality of attachment relatively well, in particular at 18 months.

In Chapter 5 the results concerning the development and determinants of three aspects of cognitive competence, general cognitive status, contingency learning and problem solving, are reported. In addition, the relationships between neonatal characteristics, problems in postural control and these aspects of cognitive competence are discussed. Finally, the results of the effect of the intervention program on each of these aspects are presented.

At each age, the mean scores on the Mental Index of the Bayley Scales of Infant Development, which were used as an index for general cognitive status, were within the normal range, but somewhat lower than the scores reported in studies using comparable samples. A relatively high percentage of mental delay (28 %) was found at 24 months. One of the most important factors which was predictive of a negative cognitive outcome at age 2, was the presence of more or less severe problems in postural control in the second half of the first year of life. No significant effects of the intervention program on general cognitive status could be found.

The results of the contingency learning task showed that 6-month-old preterm infants had problems learning the contingency. These problems were no longer present at 12 months. Regarding the relationship between the measures across the ages, it was found that infants who did not detect the contingency at 6 months were more likely to have problems controlling the feedback at 12 months, while those who were able to control the feedback at 6 months were equally likely to be able to control the feedback at 12 months. Significant relationships were found between contingency learning at the one hand, and general cognitive status at the other, although not all relationships were in the expected direction. For example, at 12 months of age a curvelinair relationship was found between the speed of contingency detection and the scores on the mental index of the Bayley. Infants who perceived the contingency at a moderately fast speed had higher mental scores than either fast or slow perceivers. Speed of contingency detection was in a similar way related to neonatal factors, neurological status and problems in postural control. Each time, moderately fast perceivers were more optimal than fast or slow perceivers. The intervention program appeared not to be effective with regard to the ability to perceive contingencies. However, as predicted, it was found that the intervention group spent more time examining the contingency relationship before they started to control the feedback than the control group.

In comparison to 18 months, infants at 24 months were more competent and more active in solving cognitive problems, and showed less frequently inattentive behaviour. This final result probably means that at 24 months infants are better able to sustain attention for a longer time than at 18 months. Competence in problem solving and inattention showed moderate to high inter-age stability. Infants who often looked somewhere other than at

the task were less competent in problem solving and scored lower on the mental scale of the Bayley. No indication was found that a premature birth may lead to attentional problems before the second year of life. On the other hand, early problems in postural control were negatively related to competence in problem solving and positively to inattention. Finally, no effects of the intervention program could be detected with respect to the infant's competence in problem solving and attentional organization.

The major issues in Chapter 6 are the identification of the mother and infant variables which are most strongly related to variations in infant cognitive performance and the clarification of the way in which these variables are related to underlying processes of attention and motivation. In addition, the relationship between measures of cognitive competence and quality of attachment are discussed.

Maternal and infant interactive behaviour appeared to be related to cognitive status, concurrently as well as longitudinally. Consistent with the results of studies of normal infants, the relations were generally weak to modest, but became stronger with increasing age. Further, it appeared that both maternal and infant variables could predict cognitive status, although the percentage of unexplained variance remained relatively large. In particular, the degree with which mothers stimulated their infant's development and the infant's 'responsiveness' appeared to be the 'best' predictors. 'Sensitive responsiveness' and 'non-intrusiveness' were only marginally related to concurrent and subsequent cognitive status. No indication was found that maternal stimulation of a high intensity was related to a low cognitive outcome in preterm infants.

Some significant relationships were found between maternal behaviour and contingency learning, but not between maternal behaviour and problem solving. Most interestingly, mothers of infants who were not motivated to master the contingency at 12 months were more intrusive and less sensitively responsive than mothers of infants who did control the feedback.

Independent of the age at which attachment was measured, infants who were securely attached had higher mean scores on the Mental Index of the Bayley Scales of Infant development at 24 months than infants who were insecurely attached. However, when individual differences in continuity of development was controlled for, the differences between securely and insecurely attached infants were no longer significant. No significant relationships were found between quality of attachment and aspects of problem solving ability. Similarly, no significant relationships were found between contingency learning at 6 months and quality of attachment. At 12 months, on the other hand, it was found that infants who detected the contingency

swiftly (fast perceivers) were more likely to be insecurely attached to their mothers at 12 and 18 months of age than infants who needed more time to detect the contingency.

In Chapter 7 some important findings are linked and discussed in more general terms. Further, our main conclusions are given. In particular, the question whether high levels of maternal stimulation may have a negative effect on the development of preterm infants is discussed. Furthermore, attention is paid to the finding that the intervention had a very restricted effect. Finally, some suggestions for the development of home-based intervention programs are given.